Early Maxillary Orthopedics: A Combination Appliance

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The concept of early maxillary orthopedics in the cleft lip and palate patient rapidly is becoming more accepted as a definite adjunct to treatment. It is a concept of intervention and prevention, or at least attempted prevention, of a condition which is quite prevalent in complete unilateral and bilateral cleft lip and palate patients subsequent to lip closure. Until recently, the medial rotation of one or both maxillary segments has been the rule and not the exception.

McNeil (*5*) was one of the first to describe a technique for early maxillary orthopedics in the cleft palate individual. His original technique employed an acrylic palatal appliance constructed over a repositioned split plaster cast. Other techniques have subsequently appeared, most of them with some type of expansion jack-screw and split in various ways (*1, 2, 6, 7, 8*). With these early attempts at early maxillary expansion and alignment of segments came problems of retention of the appliance in the mouth. There were no teeth to clasp and most of the undercut areas had to be removed so as to allow insertion and withdrawal of the appliance without undue distortion of the tissue and discomfort to the patient. More recent variations have introduced the use of soft and hard acrylics to enable one to utilize some of the undercut areas and make for better retention of the appliance (*3*).

The appliance described in this article is presented with the hope that it will be of some aid in the vast probe for real solutions to the problems associated with the early treatment of cleft lip and palate.

The appliance acts in a combined fashion in that it can be either passive or active, as the case requires. If the maxillary arch segments are in good alignment, the appliance may be used to maintain this alignment before and after lip closure (Figure 1). If the maxillary segments are in good bucco-lingual relationship to the mandible (that is, good arch width, but poor arch form), the appliance again may be used in a passive manner

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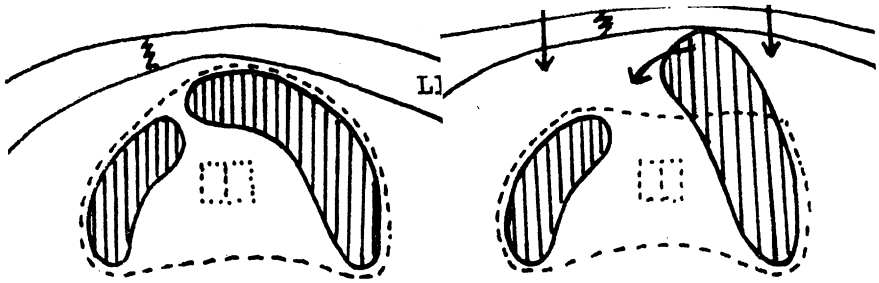

FIGURE 1. Appliance used passively to maintain position of maxillary arch segments in good alignment.

FIGURE 2. Complete unilateral cleft with appliance used passively to maintain arch width while lip pressure causes molding of maxillary segment to improve arch form.

(Figure 2). In this instance, however, it is used to maintain the lateral arch dimension while lip pressure after closure can help improve the arch form. At this early age, the molding effect of the lip upon the rotated and tipped larger maxillary segment in the complete unilateral case is most rapid. Some have reported the use of an extraoral force to augment this post-surgical molding effect in the form of an elastic strap (*1*). In our hands, the efficiency of this additional extraoral force is limited. The molding force of the lip, once it has been closed in the unilateral complete case, is sufficient to create acceptable arch form where it had been lacking originally.

On occasion, an extraoral elastic appliance has been fabricated in a fashion similar to that used by Brauer and Cronin (*1*) when a unilateral complete cleft lip and palate presents with an extreme void between the bony segments (Figure 3). In one case where this was done, the void between the bony segments changed from 20 mm to 15 mm in seven days (Figure 4). The patient was observed on an inpatient basis during this period and prior to the lip closure. To date, our use of the extraoral adjunct is the exception rather than the rule. In the complete bilateral case, we have had the same limited success that Horton and associates (*4*) report.

In the patient with bilateral complete cleft of the lip and palate, positioning of the premaxilla is very often desired. This may or may not involve resection of the vomer or bone grafting procedures. In any event, the combination appliance may again be used passively to stabilize the buccal segments of the maxilla, to prevent medial collapse, and to allow the premaxilla sufficient room in lateral dimension to position itself (Figure 5).

Because the appliance carries with it an imbedded jack-screw, it can be made into an active maxillary segment expansion appliance when the need arises simply by splitting the acrylic and activating the jack-screw.

It has also been reported that the hard palate is simulated by appli-

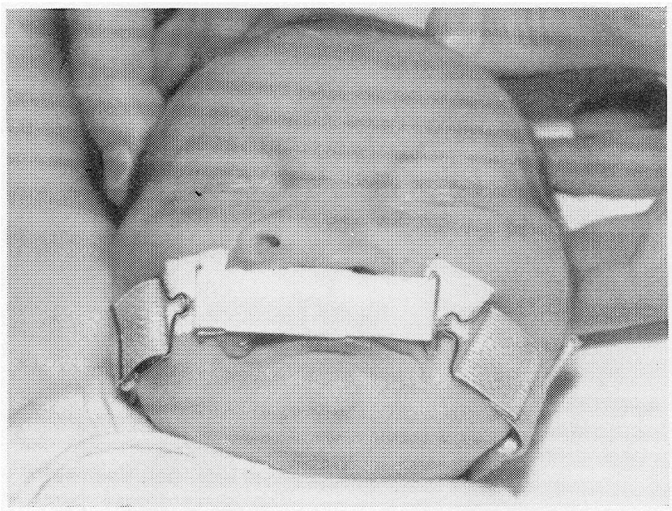

FIGURE 3. Extraoral appliance.

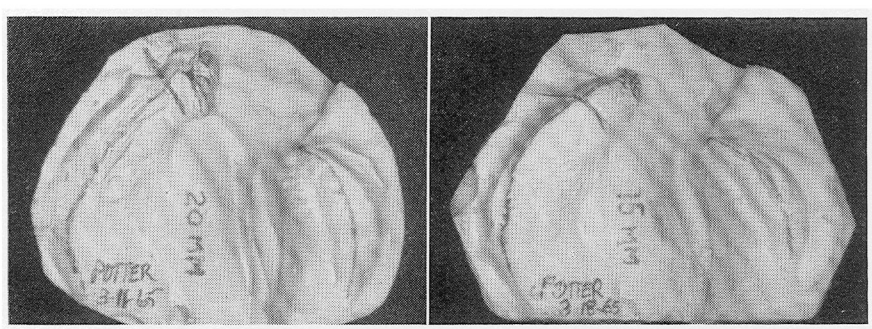

FIGURE 4. Case showing decrease in size of opening between bony segments from 20 mm (left) to 15 mm (right) using only extraoral appliance before lip closure.

ances such as these when they are used in either an active or a passive manner. This has been said to have a favorable effect upon feeding, tongue posture and function, and, if used for a prolonged period, the development of speech. Though we cannot pass judgment at this time on the effect of speech development and tongue posture, our experience tends to confirm a favorable effect upon feeding.

Soft and hard acrylics are used in the construction of the appliance to take maximum advantage of the undercut potential. The appliance is fabricated completely on the working cast. The retentive facility of the appliance depends completely on the accuracy of the working cast. The impression is taken with the object of including every available undercut in the work cast (Figure 6). The consistency of the impression material (alginate) is fairly stiff and the mix is such that the material will set quickly. The infant is seated in an upright position on the parent's lap.

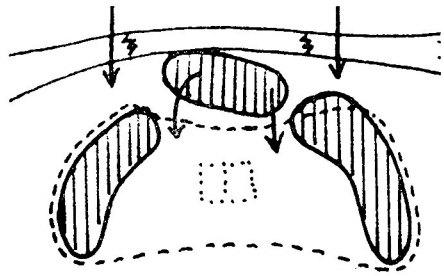

FIGURE 5. Appliance used passively in complete bilateral cleft to stabilize buccal maxillary segments to allow positioning of the premaxillary segment.

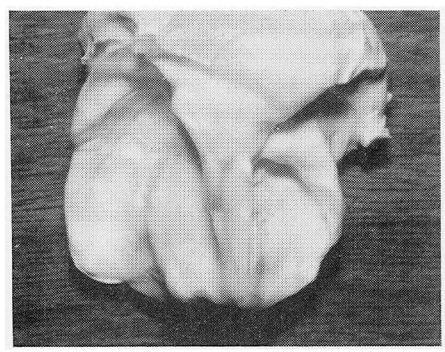

FIGURE 6. Impression showing extension of material into every available undercut area.

The tray is carried to place and the infant's head is tipped far forward. This will allow gravity to remove any slight particle of impression material that may become dislodged upon removal of the impression. A mechanical aspirator routinely is at hand if needed. No anesthetic is used, and although preoperative medication is possible, it is rarely used. It is desirable to have the baby cry during the procedure since this allows greater visual access and assures that the airway is unobstructed. The impression material should extend as far into the palatal cleft area as possible.

The resultant working cast of plaster demonstrates the undercut areas which are essential to the successful retention of the appliance (Figure 7).

After the cast has been suitably treated with a separating media, any area of undercut is filled with a soft cold cure acrylic (Figure 8, left). This may be done by the alternate liquid-powder spray technique. A few minutes are then allowed for the setting of this soft acrylic. The hard cold cure acrylic is then sprayed on with a small spring-tension jackscrew imbedded at the midline (Figure 8, right). Clear acrylic is used at this point so that when the finished appliance is inserted, a blanching of

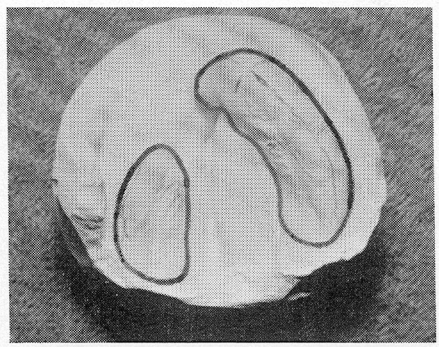

FIGURE 7. Resultant working cast.

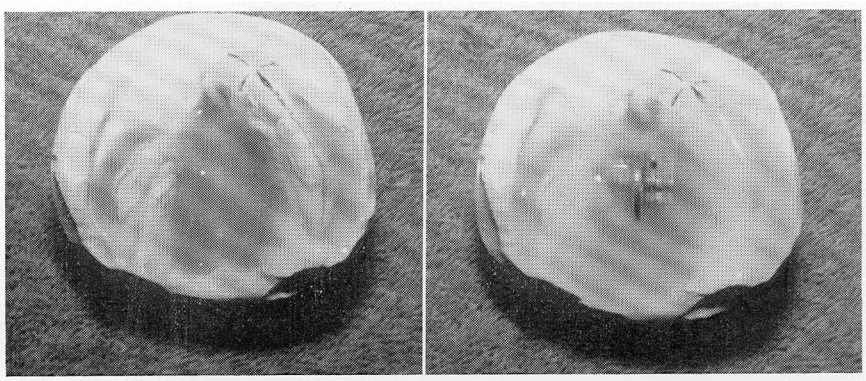

FIGURE 8. Left, all areas of undercut filled with soft cold cure acrylic. Right, clear hard cold cure acrylic sprayed, with small spring-tension jack-screw imbedded at the midline.

the gingival and palatal tissues may be observed as the appliance is firmly seated.

The appliance is trimmed and finished and, if it is to be used passively, the jack-screw is left imbedded in the clear acrylic (Figure 9). If activation is desired, a disc is used to separate the palatal segments. The appliance as viewed from the palatal aspect (Figure 10, left) and from the anterior (Figure 10, right) shows the soft acrylic extensions into the areas of undercut. If the soft acrylic tends to stiffen after a period of time and prolonged use, some warm water will quickly restore its flexibility.

To date, these finished appliances have been well tolerated by the infants. With proper trimming, especially in the buccal sulcus areas, the retention has been very good (Figure 11). The infants are seen on an outpatient basis. Parents have been instructed to remove the appliance only for cleaning and replace it immediately using a denture adhesive. Some of the appliances have remained inserted, without removal, for as long as three weeks, demonstrating little or no clinical evidence of tissue irritation or accumulation of debris.

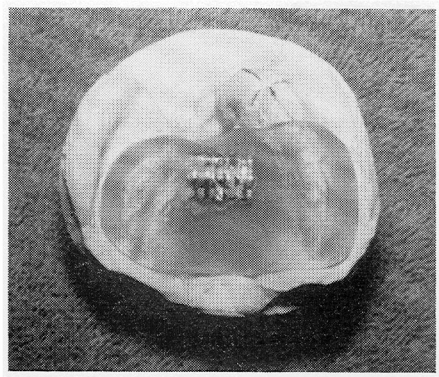

FIGURE 9. Finished passive appliance. Left in place, this design will allow favorable molding of the anterior part of the larger maxillary segment.

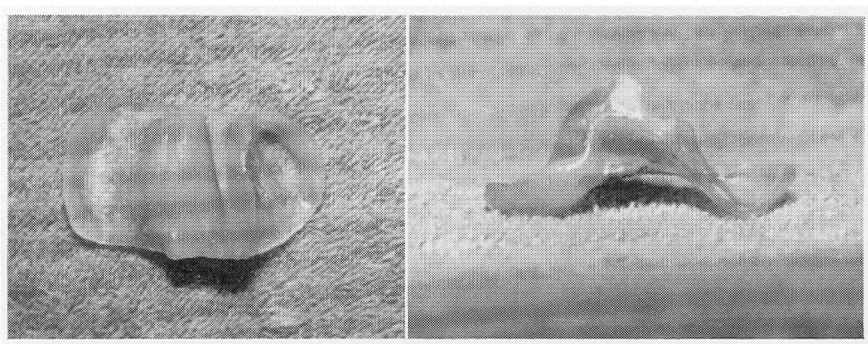

FIGURE 10. Left, appliance viewed from palatal aspect. Right, anterior view.

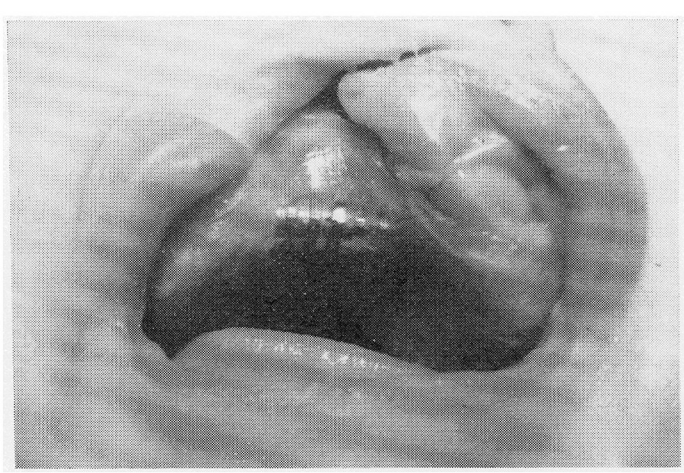

FIGURE 11. Appliance try-in before lip surgery.

In the unilateral case, the molding effect on the maxillary segments by the lip following surgery has been especially gratifying. In theory, our approach holds that if the lip can be closed surgically, the combination appliance makes possible the favorable molding of the maxillary segments by lip pressure. Usually extraoral elastic bandages or appliances are not needed. This has been accomplished clinically (Figures 12 and 13).

Figure 12 shows the upper arch of an infant with a unilateral complete cleft of lip and palate which originally presented with a 15 mm void between the maxillary bone segments anteriorly and poor arch form (Figure 12, left). The passive combination appliance was placed at the time of lip closure and worn constantly, without extraoral adjunct, for approximately seven weeks. Arch form improved markedly and the bony void reduced to 4.5 mm (Figure 12, right).

As previously noted, the patient in Figure 4 presented at the time of lip surgery with an anterior bony void of 15 mm. When the lip was surgically closed, the combination appliance was placed passively. The extraoral force was discontinued and after 3½ weeks (Figure 13) arch form was

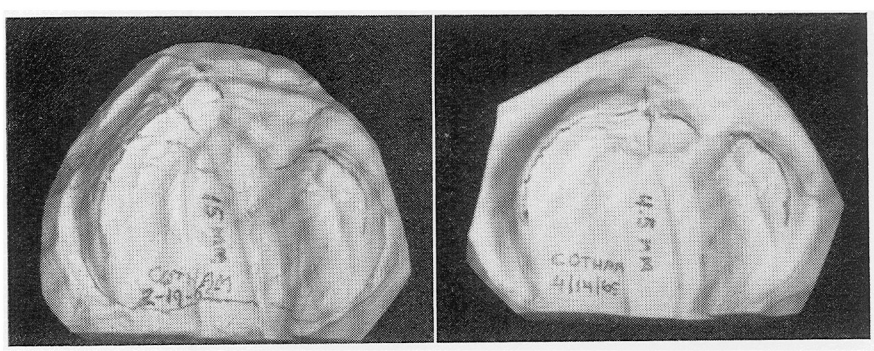

FIGURE 12. Case demonstrating decrease in anterior bony cleft after lip closure from 15 mm (left) to 4.5 mm (right) in seven weeks using only passive combination appliance and allowing lip pressure to mold larger arch segment.

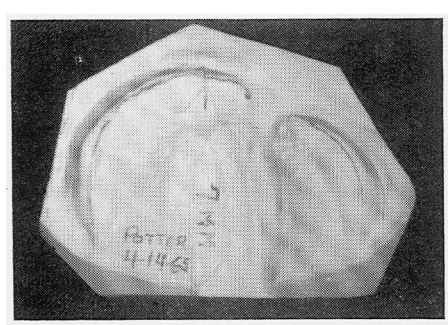

FIGURE 13. Three weeks after lip closure. Anterior bony void reduced from 15 mm to 7 mm with much improved arch form.

markedly improved through lip pressure and molding of the larger arch segment. The anterior bony void was reduced to 7 mm.

Summary

As the concept of early maxillary orthopedics becomes more widely accepted and practiced, many variations in appliance design, fabrication, and use appear. This paper presents one of these variations, a combination appliance, which is fabricated from soft and hard cold cure acrylic resins. The appliance can be used either passively or actively in such a manner as to effect maxillary segment rotation and positioning. It is the hope of the authors that this may somehow contribute to the more extensive habilitation of the cleft lip and palate patient. Only further use, observation, and study will determine the true worth of this approach in the overall treatment program.

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